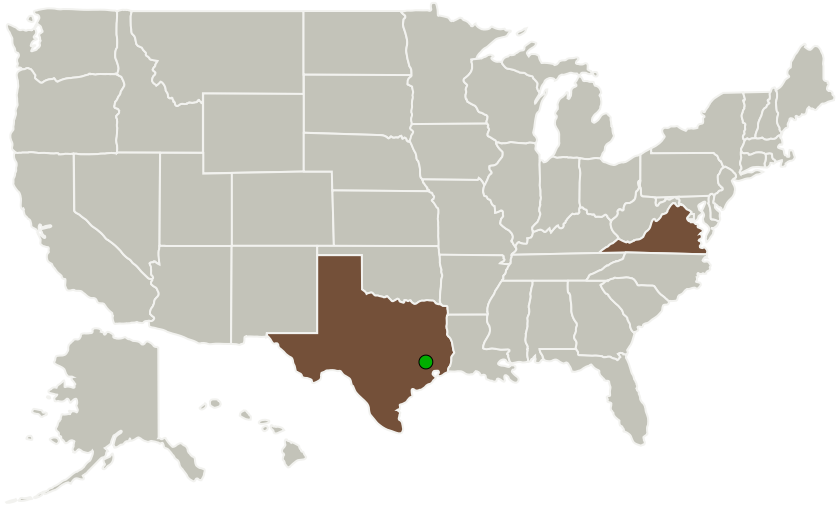
# Integrated Structural Health Sensors for Inflatable Space Habitats, Phase I

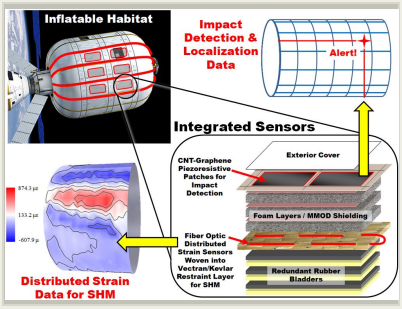
Completed Technology Project (2016 - 2016)

## Project Introduction

Luna will partner with Dr. Daewon Kim and Dr. Sirish Namilae of Embry Riddle Aeronautical University to develop a multifunctional structural health monitoring solution for lightweight composites used in long duration space habitats. A combination of fiber optic sensors, for strain and temperature monitoring, and piezo resistive sensors, for impact detection, will be utilized to provide a flexible and lightweight health monitoring solution. Luna's high definition fiber optic measurement system utilizes low cost optical fiber to report strain or temperature points every 1.25 mm to 5 mm along the sensing fiber. Fiber can be embedded in the composite materials to detect changes in the structure and predict early onset of failure, prior to visible damage. The piezo resistive sensors will be mounted on flexible soft goods materials. During Phase 1, Luna will fabricate a small-scale expandable composite test article and demonstrate the ability to sense strain using embedded optical fiber and detect impact events using surface mounted piezo resistive sensors. During Phase II, Luna will demonstrate a solution that fuses data from both sensing techniques into one platform for a cohesive SHM solution. Phase III will focus on transitioning the technology to NASA and NASA affiliates such as Bigelow Aerospace.

## Primary U.S. Work Locations and Key Partners



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## Table of Contents

# Integrated Structural Health Sensors for Inflatable Space Habitats, Phase I

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| Luna Innovations, Inc. | Lead Organization | Industry | Roanoke, Virginia |
| Johnson Space Center(JSC) | Supporting Organization | NASA Center | Houston, Texas |

| Primary U.S. Work Locations | |
|---|---|
| Texas | Virginia |

## Project Transitions

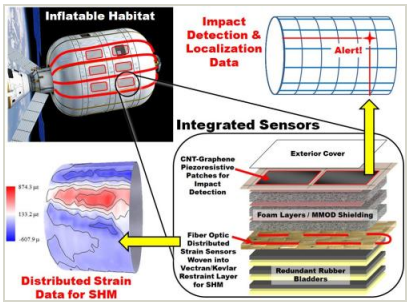
**June 2016:** Project Start

**December 2016:** Closed out

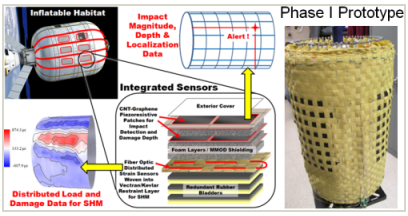
**Closeout Documentation:**

- Final Summary Chart*(https://techport.nasa.gov/file/139932)*

## Images




**Briefing Chart Image**
Integrated Structural Health Sensors for Inflatable Space Habitats, Phase I *(https://techport.nasa.gov/image/127324)*




**Final Summary Chart Image**
Integrated Structural Health Sensors for Inflatable Space Habitats, Phase I Project Image *(https://techport.nasa.gov/image/126856)*

## Organizational Responsibility

**Responsible Mission Directorate:**
Space Technology Mission Directorate (STMD)

**Lead Organization:**
Luna Innovations, Inc.

**Responsible Program:**
Small Business Innovation Research/Small Business Tech Transfer

## Project Management

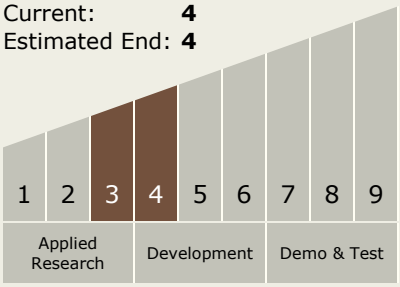
**Program Director:**
Jason L Kessler

**Program Manager:**
Carlos Torrez

**Principal Investigator:**
John Ohanian

## Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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## Technology Areas

**Primary:**

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.2 Structures
    - TX12.2.3 Reliability and Sustainment

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System